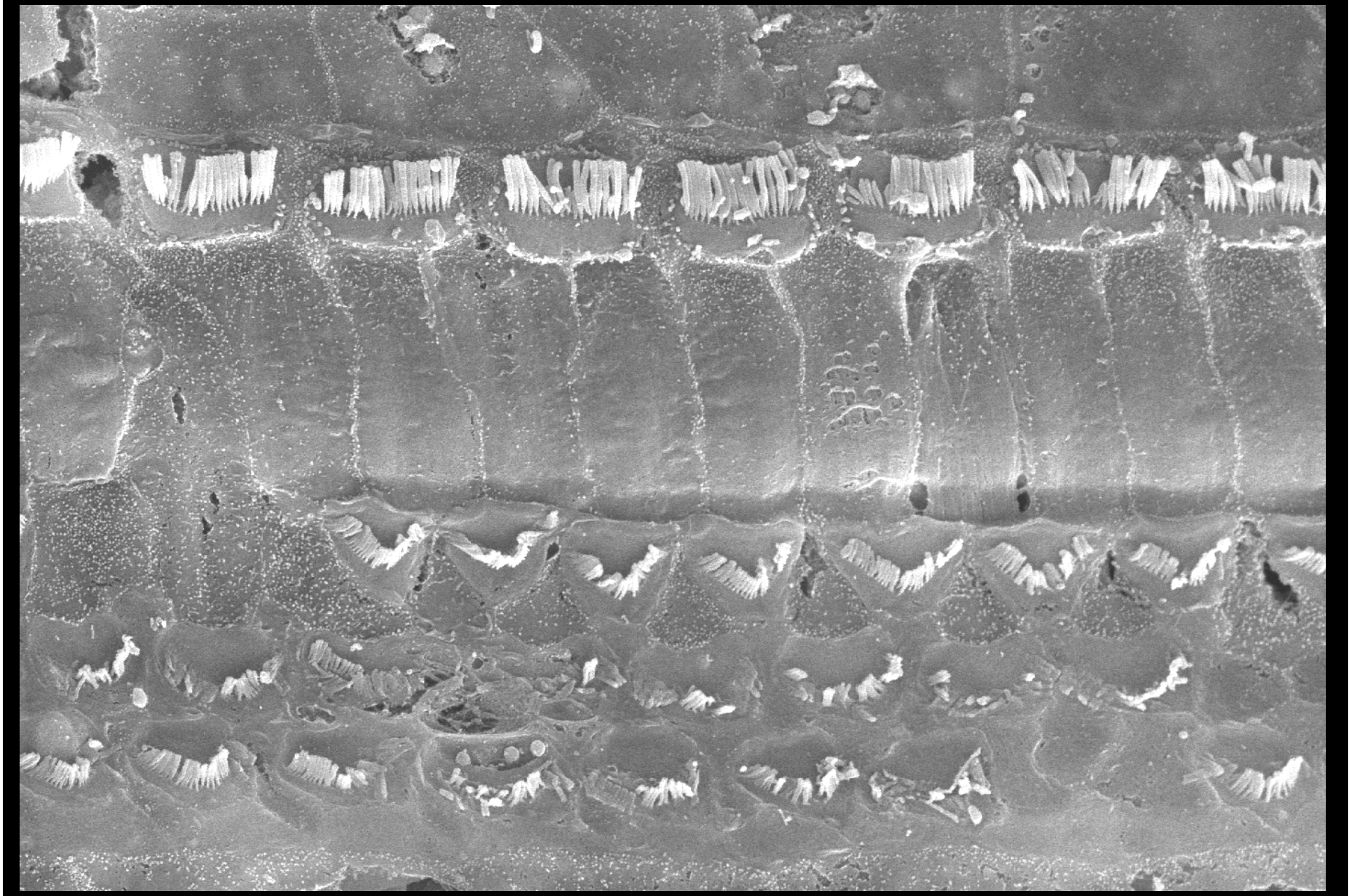
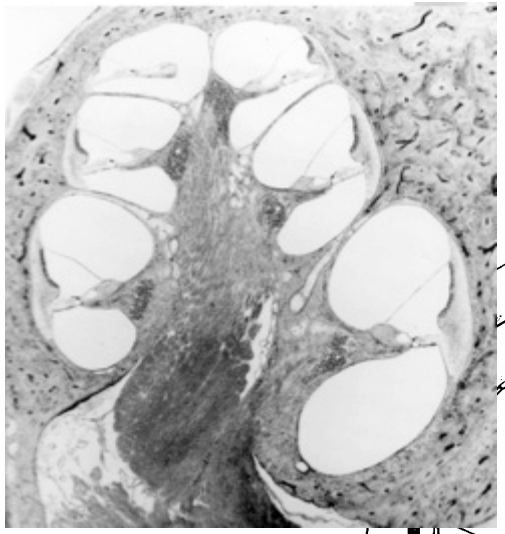
Outer haircells degenerating soon after gentamicin treatment (chinchilla model)



Cochlear areas of maximum vulnerability



Stria vascularis

hypoxia, ischemia
loop diuretics (Lasix)
metabolic inhibitors
old age
viral infection
genetic mutation
(sometimes reversible)

Haircells

ototoxic drugs
e.g. aminoglycosides
old age
acoustic trauma
genetic mutation
(not reversible)

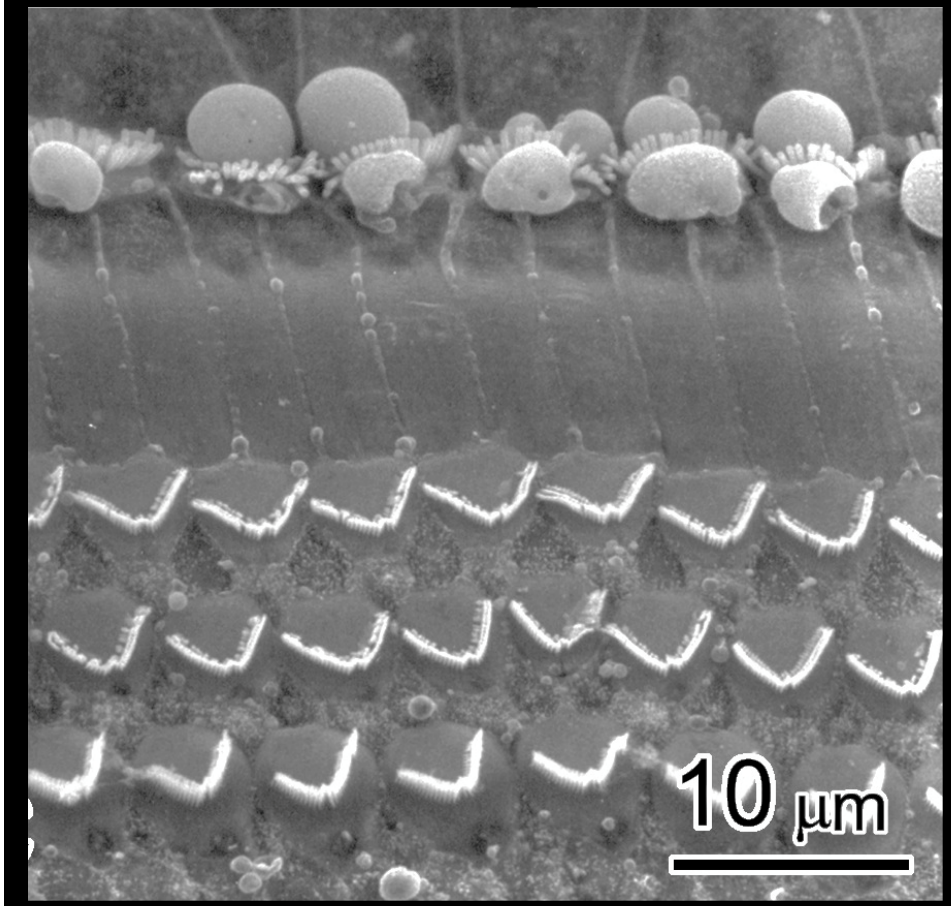
Inner haircell synapse

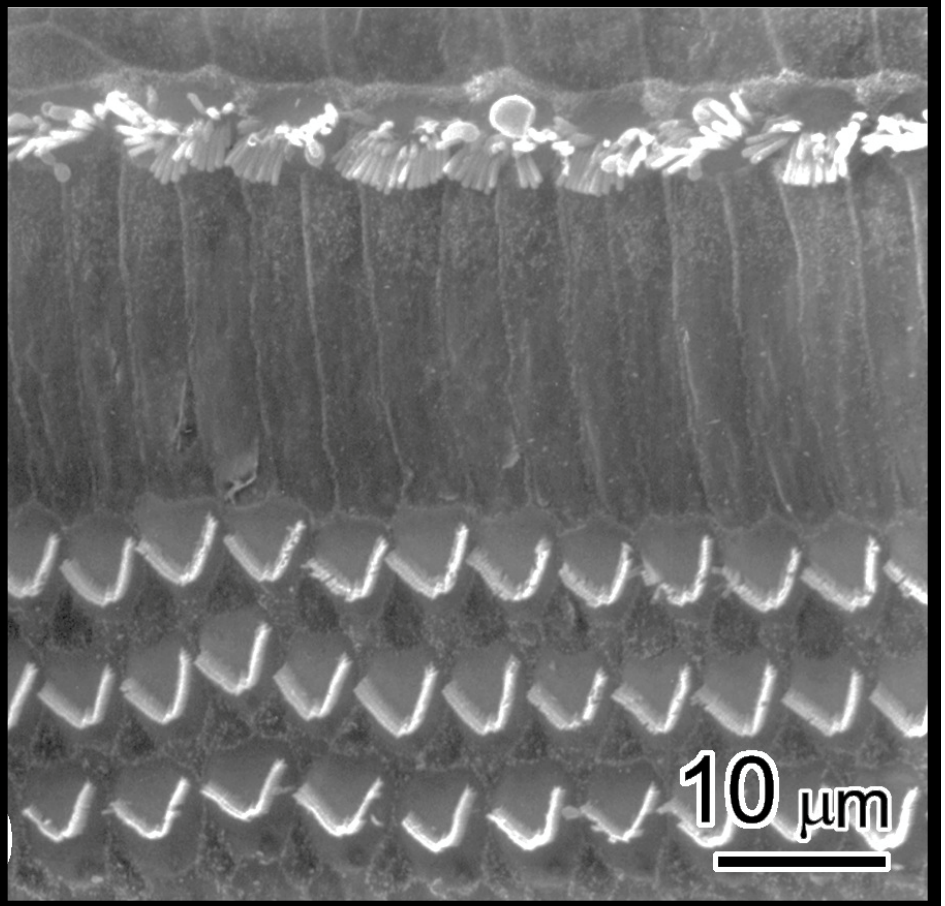
some drugs e.g. aspirin
chronic hypoxia
anti cancer drugs – carboplatin
noise exposure
(sometimes there is recovery)

Spiral ganglion cells

loss of inner haircells
Glutamate excitotoxicity
Sensorimotor neuropathy
Hidden hearing loss?

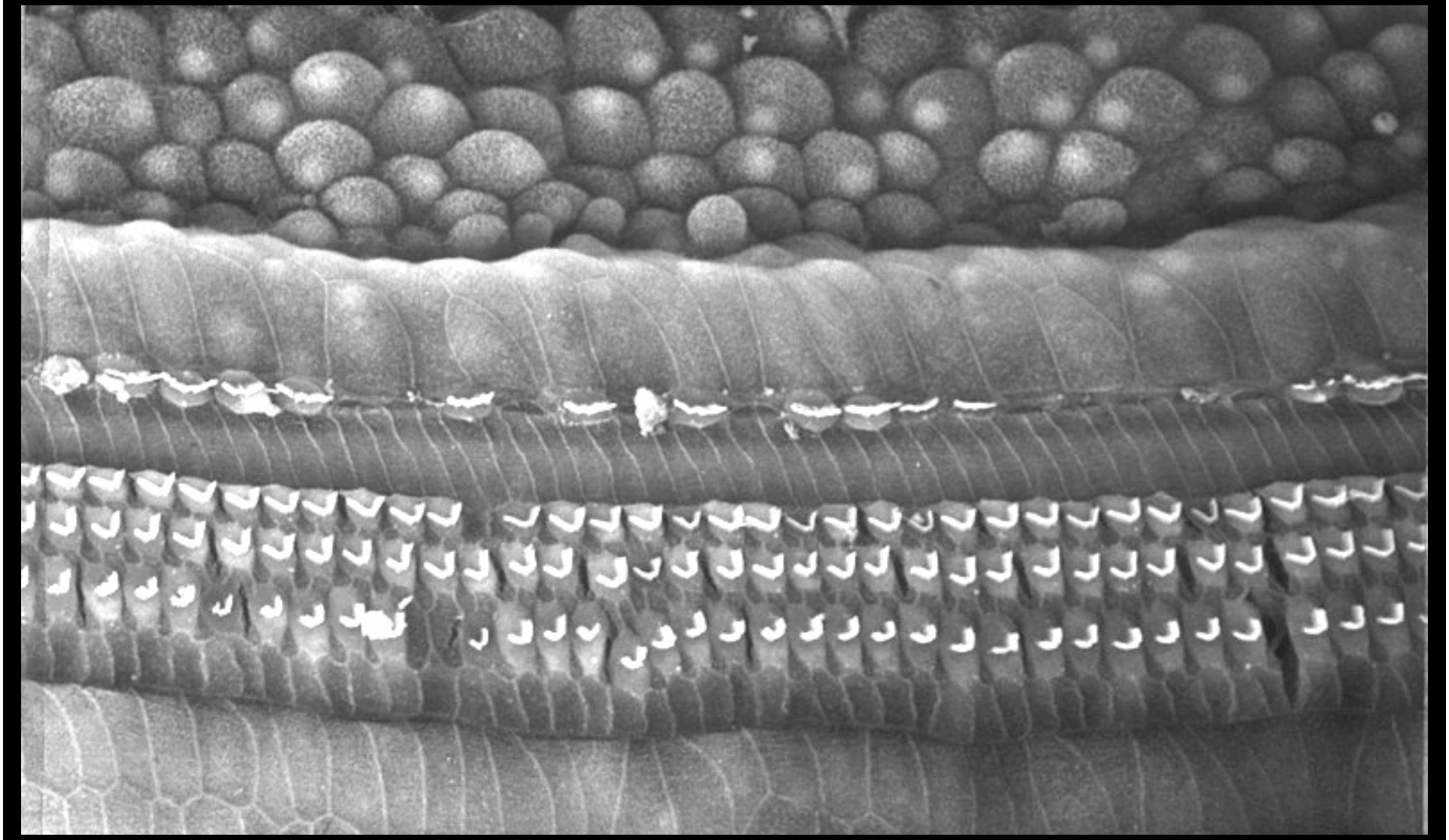
Ototoxicity of deferoxamine (chinchilla model)





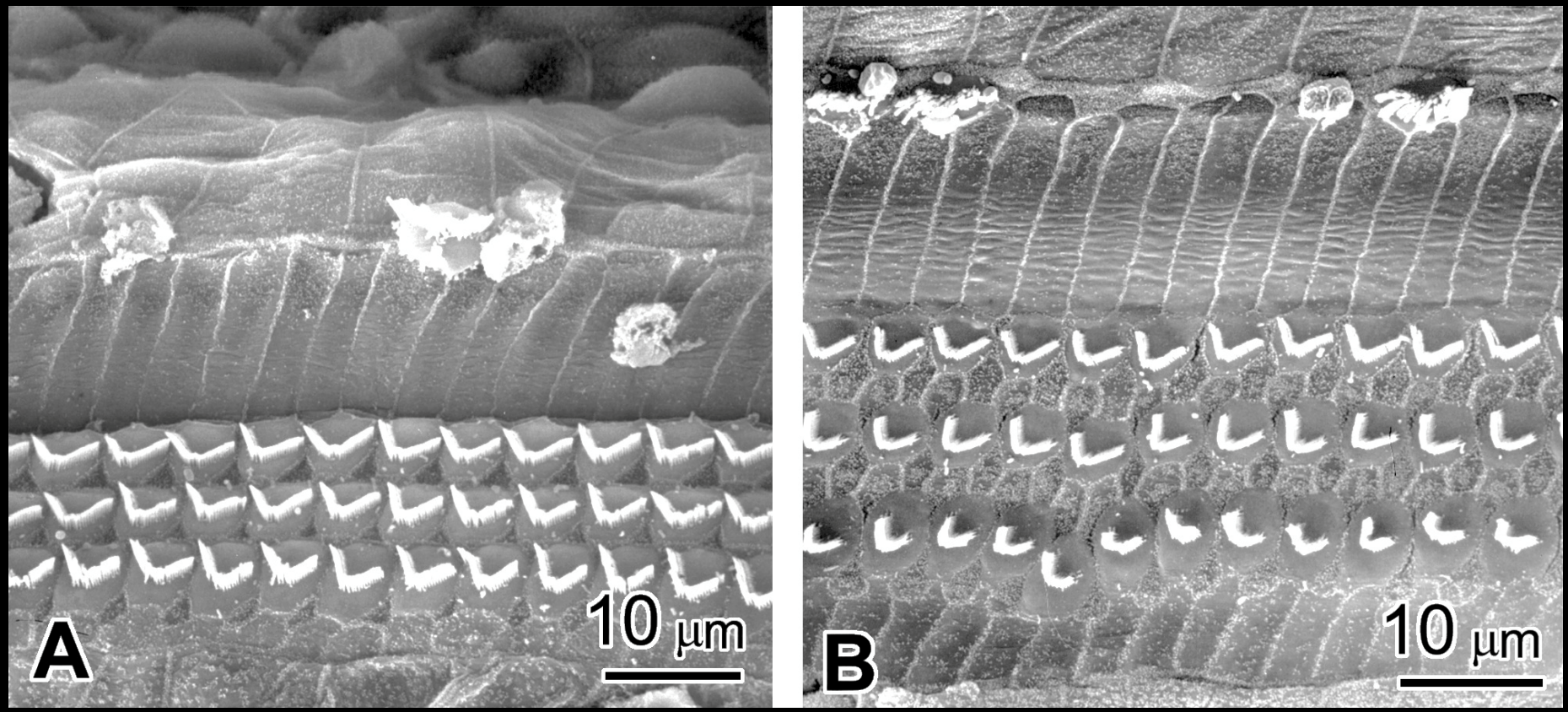
OLIVIERI N. F., BUNCIC, R., CHEW, E., GALLANT, T., **HARRISON, R.V.**, KEENAN, N., LOGAN, W., MITCHELL, D., RICCI, G., SKARF, B., TAYLOR, M., & FREEDMAN, M.H. (1985): Visual and auditory neurotoxicity in patients receiving subcutaneous deferoxamine infusions. New England J. of Med., Vol. 314, 869-873

Inner haircell lesions after carboplatin treatment (chinchilla)



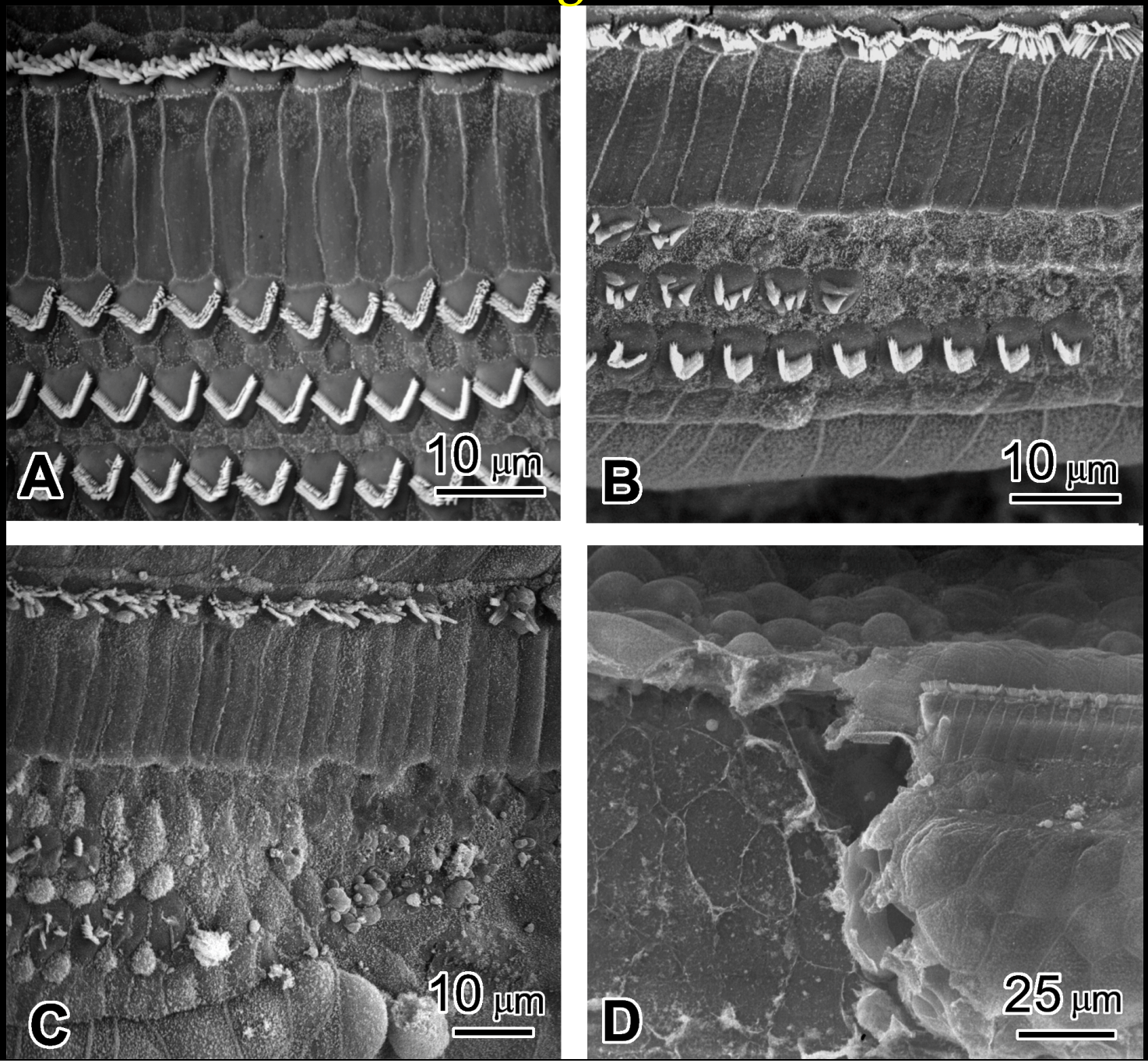
Cochlear inner haircell damage resulting from long term hypoxia

A causal factor in Auditory Neuropathy Spectrum Disorder (ANSD)

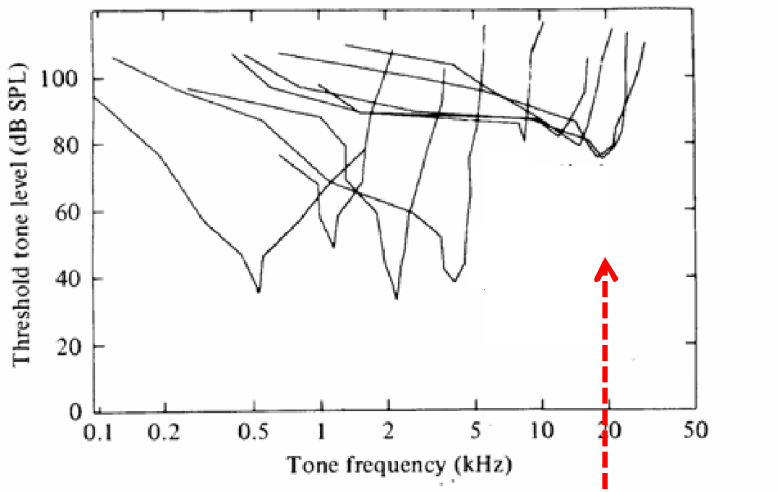


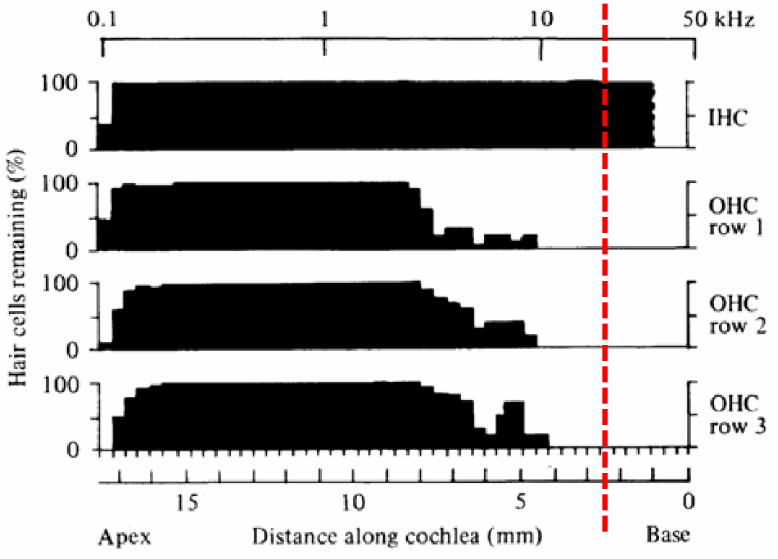
Harrison RV (1998) An animal model of auditory neuropathy. Ear and Hearing 19: 355-361

Acoustic trauma can damage outer and inner haircells



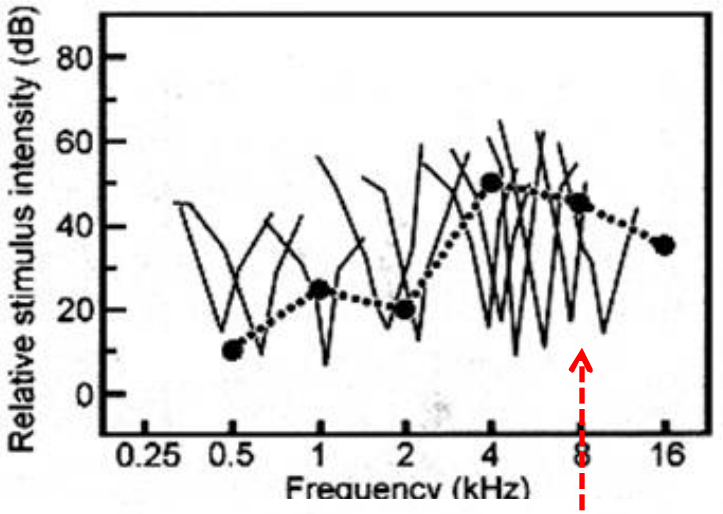
Central neurons have elevated thresholds, poor frequency tuning

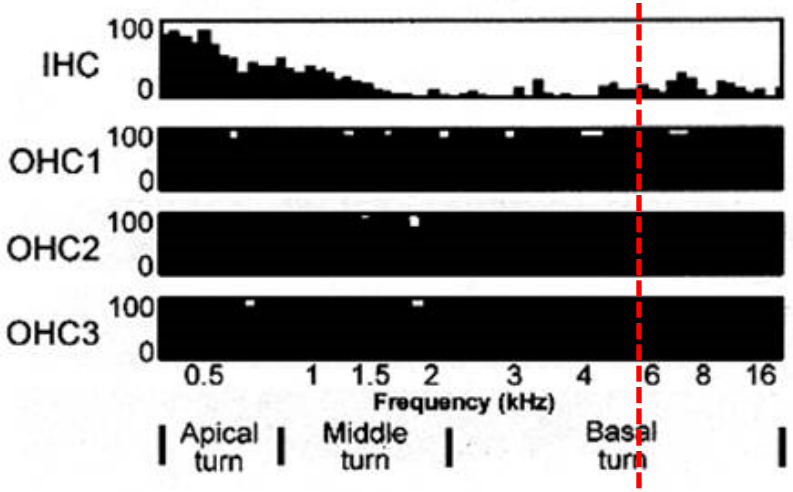




outer haircell loss.
inner haircells intact

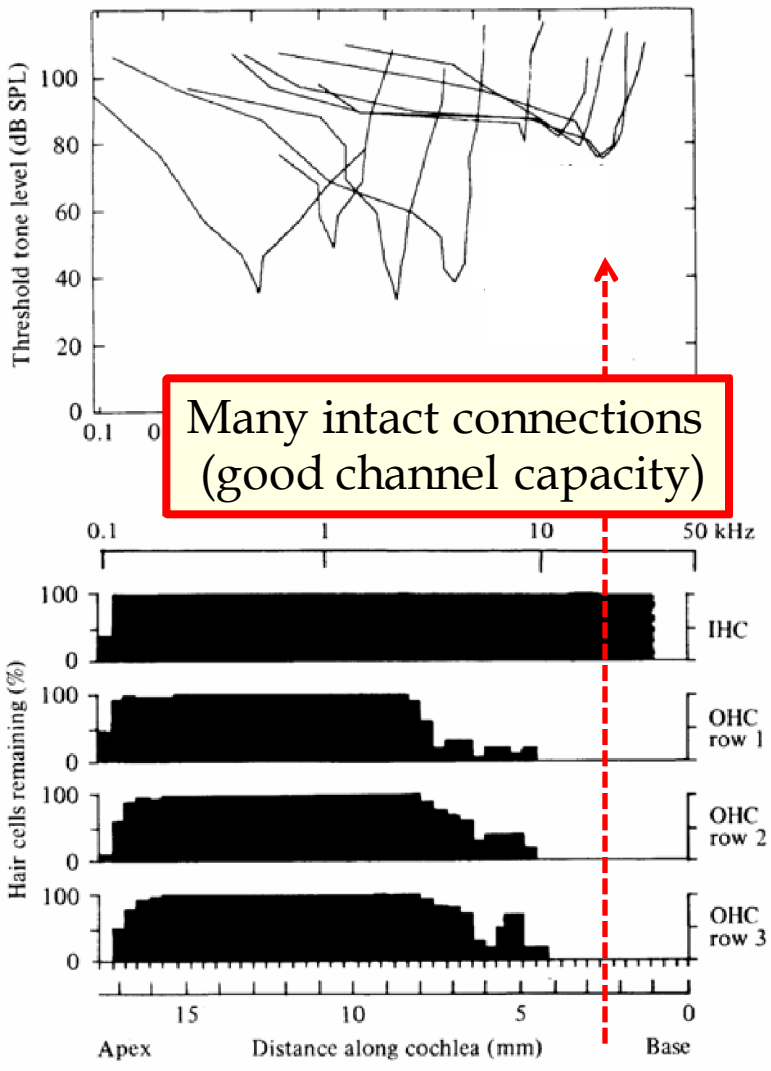
Central neurons have low thresholds and sharp tuning





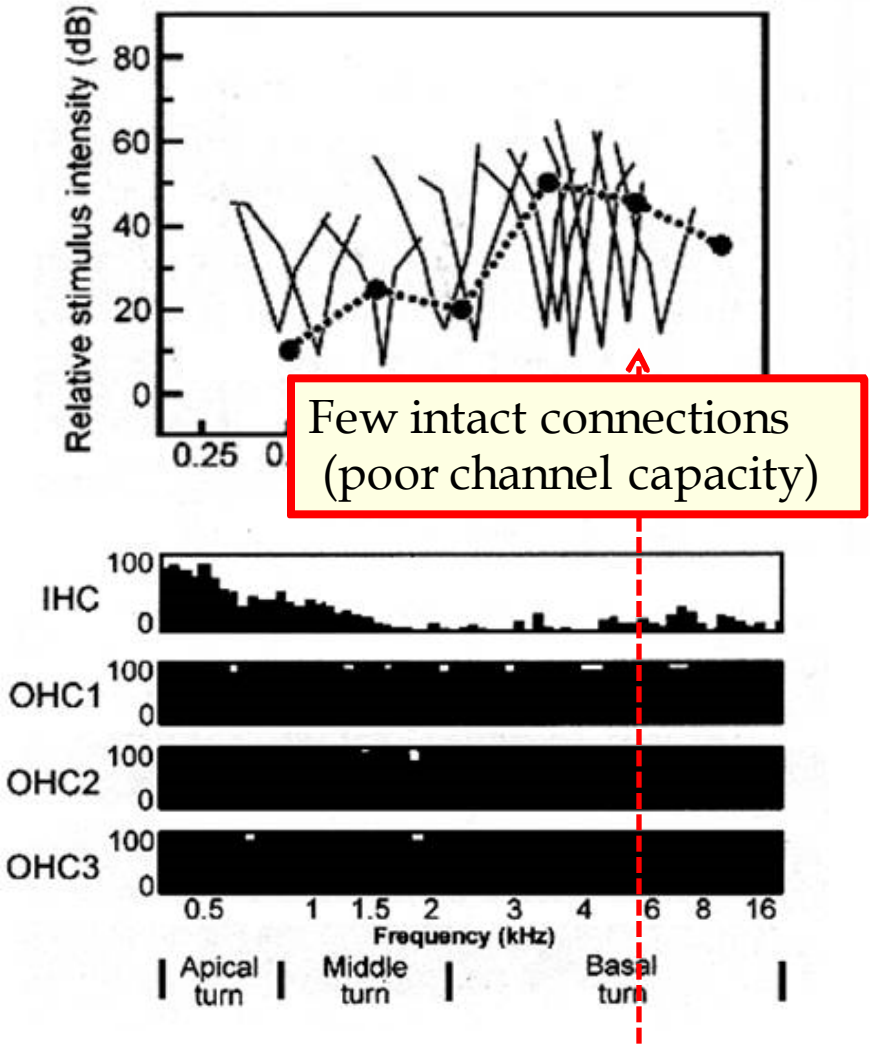
inner haircell loss (partial)
outer haircells intact

Central neurons have elevated thresholds, poor frequency tuning



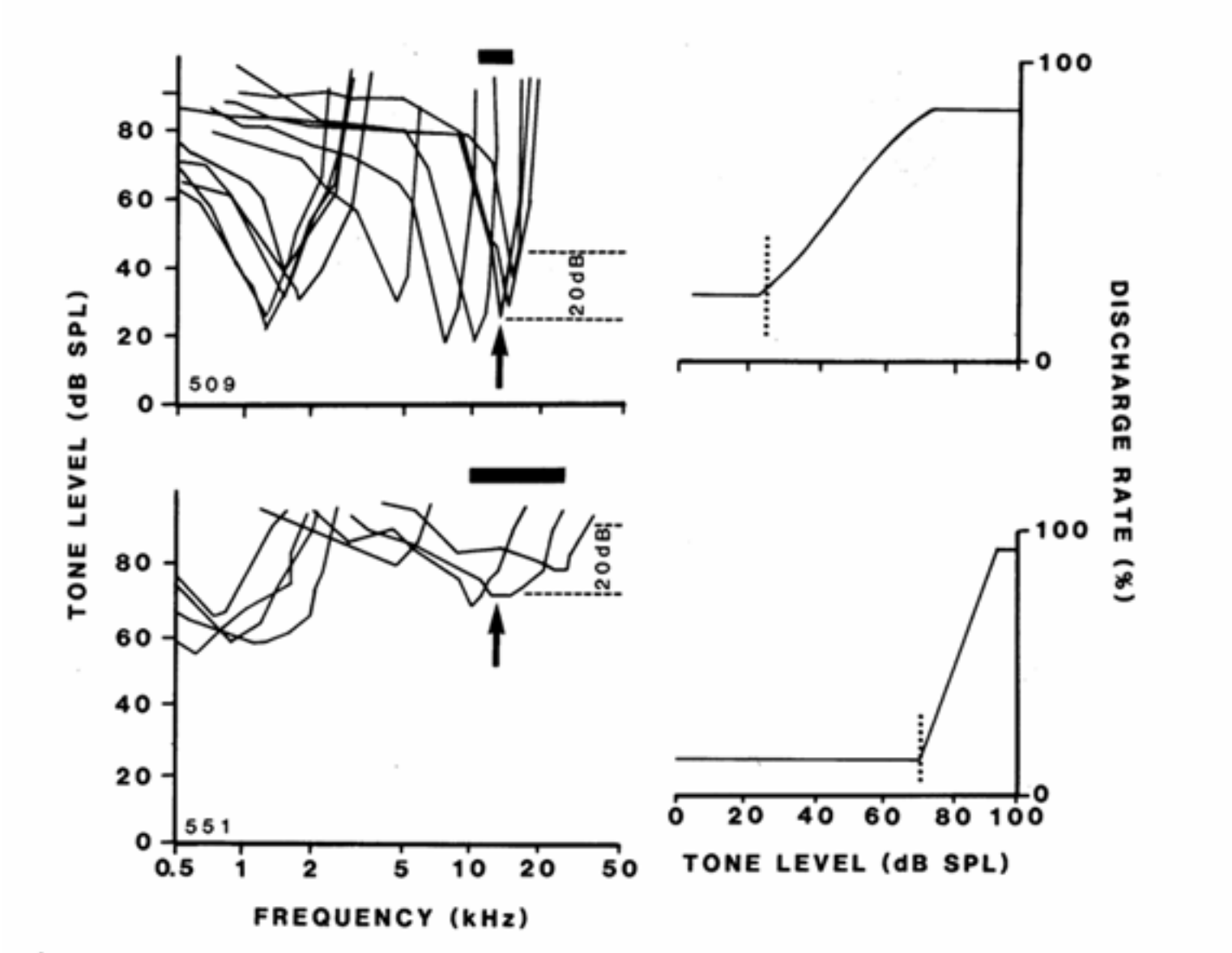
outer haircell loss.
inner haircells intact

Central neurons have low thresholds and sharp tuning

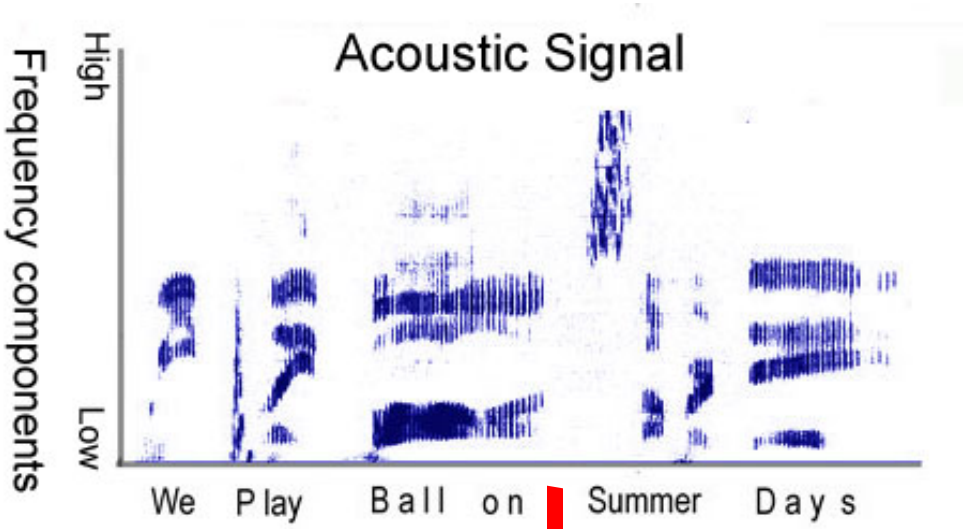


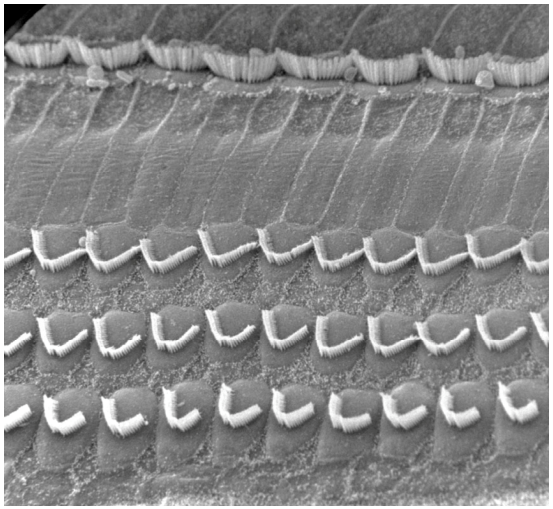
inner haircell loss (partial)
outer haircells intact

Loudness recruitment is a consequence of outer haircell loss

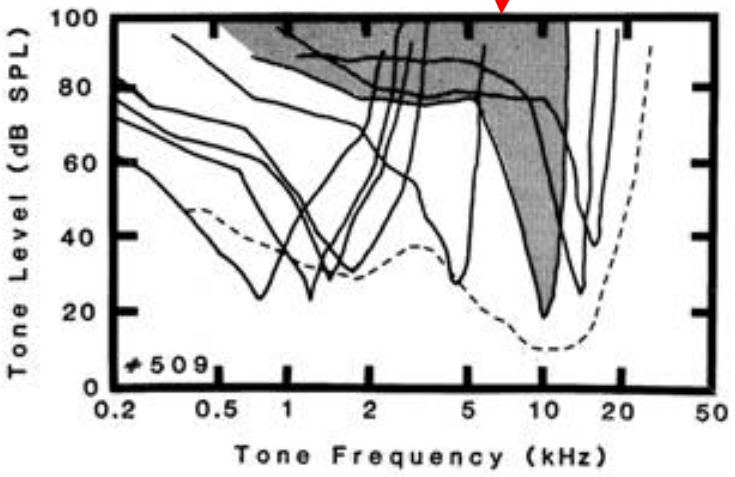


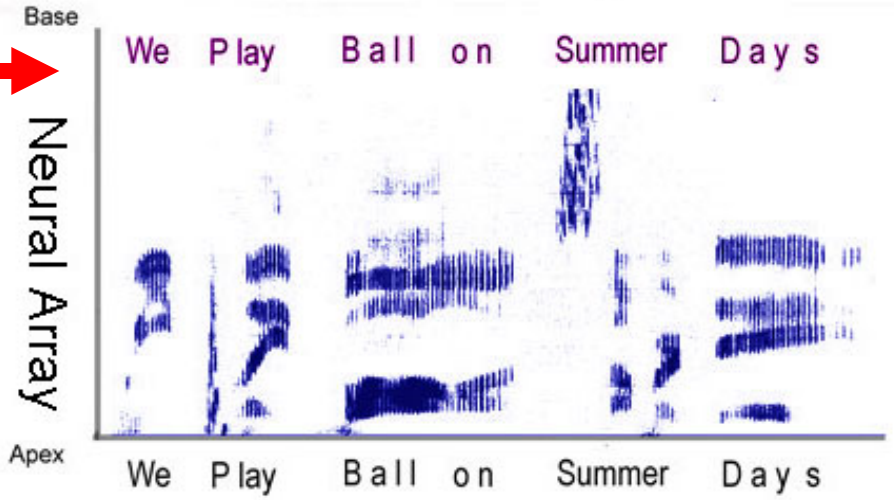
Coding of speech signals by the normal cochlea





Good neural Representation





Cochlear Analysis Filters